

California Regulation for the
Mandatory Reporting of Greenhouse Gas Emissions

**Reporting of Electricity Generation and
Cogeneration Units**

Updates and Clarifications on Reporting Requirements

February 14, 2013

Presentation Slides Available Here:

<http://www.arb.ca.gov/cc/reporting/ghg-rep/guidance/guidance-training.htm>

Outline

- Introduction
- Applicability
- 2012 Rule Amendments
- Types of Facility; Facility Boundary
- System Energy Accounting
- Examples

Introduction

Sec. 95112:

- Contains reporting requirements for electricity generating units (EGU) and cogeneration unit
- References 40 CFR Part 98, Subparts C and D
- References sec. 95115 for emission calculation method and fuel sampling/monitoring requirements
- Has no counterpart in 40 CFR Part 98
- Covers both Part 75 and non-Part-75 EGUs (unlike 40 CFR Part 98 that treats non-Part-75 EGUs as general stationary combustion sources)

§95112 Applicability

- Part 75 power plants, regardless of emissions level
- Stand-alone power plants and cogeneration facilities with $>10,000$ MTCO_2e of emissions
- Industrial, commercial, institution facilities with on-site EGU that have $>10,000$ MTCO_2e of facility total emissions
- Any facilities with $>10,000$ MTCO_2e of emissions that have any non-fuel-based renewable EGU with nameplate capacity of >0.5 MW

2012 Rule Amendments

- Added clarifications based on the feedback and questions received during the previous reporting seasons
- Removed limitations to aggregating units that are integrated into an electricity generating system
- Modified the way supplemental firing is reported
- Reinstated two reporting items for bottoming cycle cogeneration units: input steam to steam turbine and output of heat recovery steam generator (HRSG)

Type of Facilities & Facility Boundary

- Stand-alone electricity generating facility
- Independently operated cogeneration/bigeneration facility co-located with the thermal host
- Independently operated and sited cogeneration/bigeneration facility
- Industrial/institutional/commercial facility with electricity generation capacity

[Definitions in §95102(a)]

Type of Facilities & Facility Boundary

- *Independently operated cogeneration/bigeneration facility co-located with the thermal host:* on contiguous property as the thermal host and/or is located within the same fence line
- *Independently operated and sited cogeneration/bigeneration facility:* on separate properties that are not contiguous
- Treatment of facility boundaries for these 2 cases are the same
- No common control or common ownership as the thermal host

Type of Facilities & Facility Boundary

- If the cogen/bigen and the thermal host are on contiguous/adjacent property and there is common control or common ownership: the thermal host must be included in the same facility boundary
- Such a facility is an *industrial/institutional/commercial facility with electricity generation capacity*
- Any applicable emission sources of the thermal host must also be included in the combined GHG report of the cogen/bigen facility and the thermal host

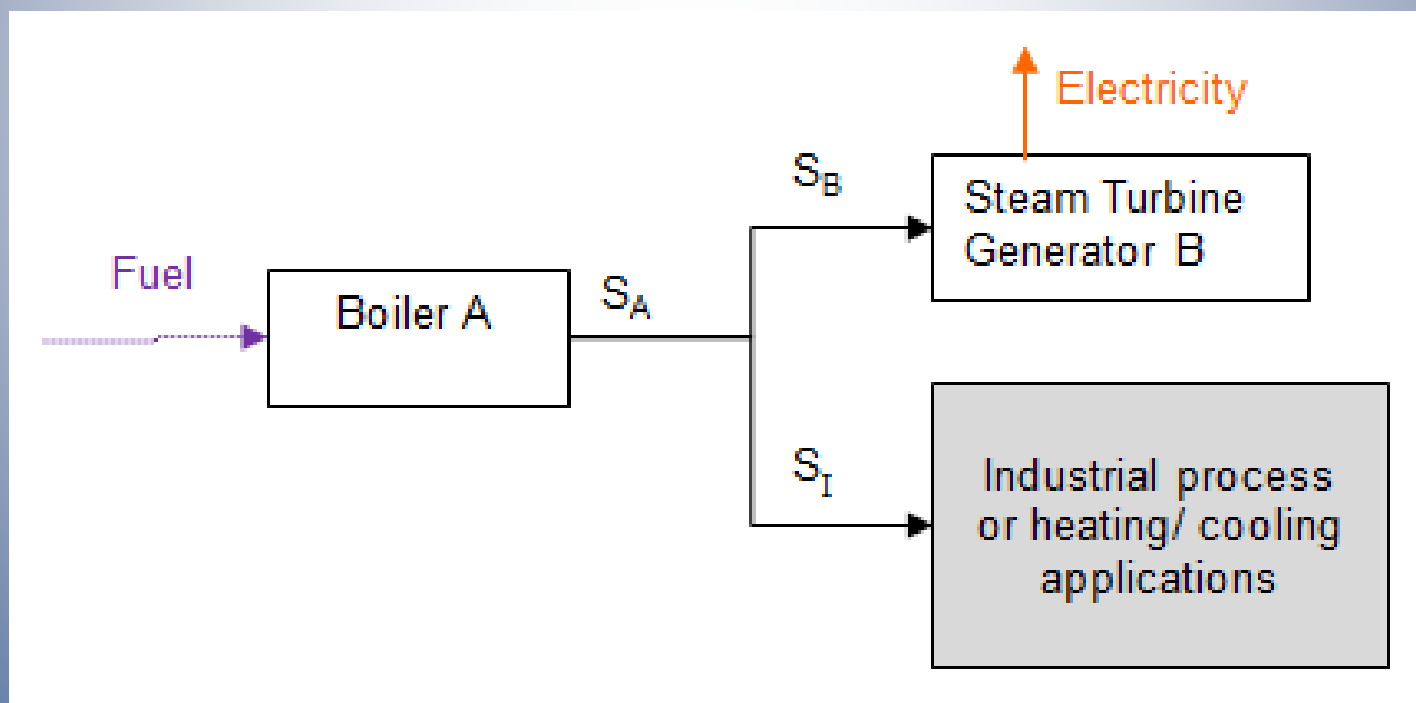
Type of Energy Dispositions

In the reporting tool pull-down menu, select:

- Grid-dedicated facility (most stand-alone power plants)
 - Facility that does not provide any generated energy outside of the facility boundary (rare)
 - None of the above (most other electricity generating facilities)
-
- Facility boundary is determined by the “facility” definition in §95102(a), not necessarily by the fence line of the physical property

Bigeneration

- EGU that simultaneously produces electricity and steam from the same fuel source but does not utilize waste heat.



System Approach

- Reporters are encouraged to aggregate the individual units in an electricity generating system (EGS) if all the units are integrated into the system. (System aggregation is preferred.)
- A system can be a:
 - Cogeneration system
 - Bigeneration system
 - Combined-cycle electricity generation system
 - System of boilers producing steam to power steam turbine generators
- “Integrated” = the units that generate electricity or thermal energy are not the same units that consume fuels, and the energy output from the system cannot be traced to fuel input at related fuel combustion units in an undivided path in a system energy balance diagram

System Approach

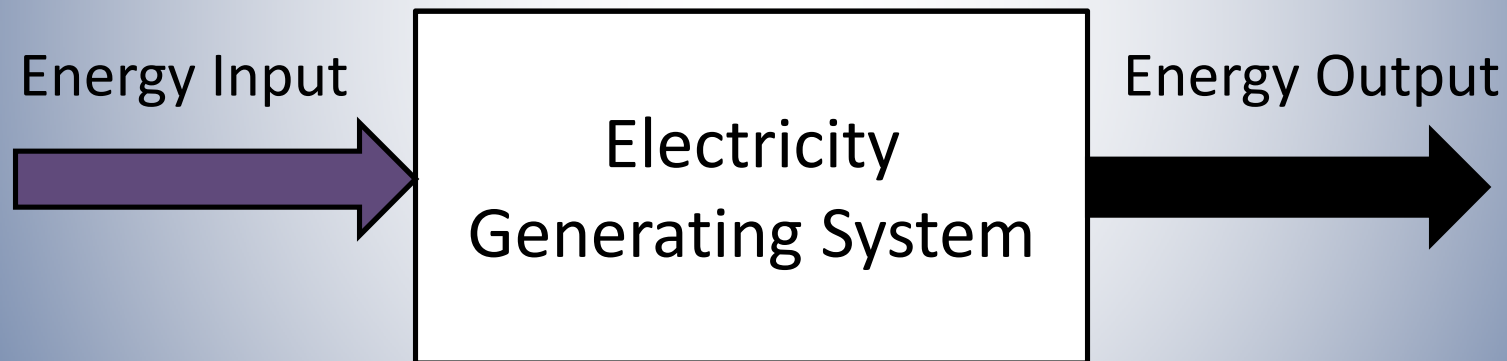
- If there is more than one EGS at the facility, each system must be reported separately.
- EGU and EGS must never be aggregated with other non-EGU stationary fuel combustion sources. (Treatment for common stack reporting is different.)
- Auxiliary boiler or stand-by boiler:
 - If the boiler contributes to electricity generation (boiler steam feeds a steam turbine generator), it is an integral part of the cogen system
 - If the boiler does not contribute to electricity generation, it is not a part of the cogen system

System Approach

- However, reporters are encouraged to report simple-cycle EGUs at the same disaggregation level as in the reports they submitted to ARB in previous years or in reports submitted to CEC and EIA for consistency.

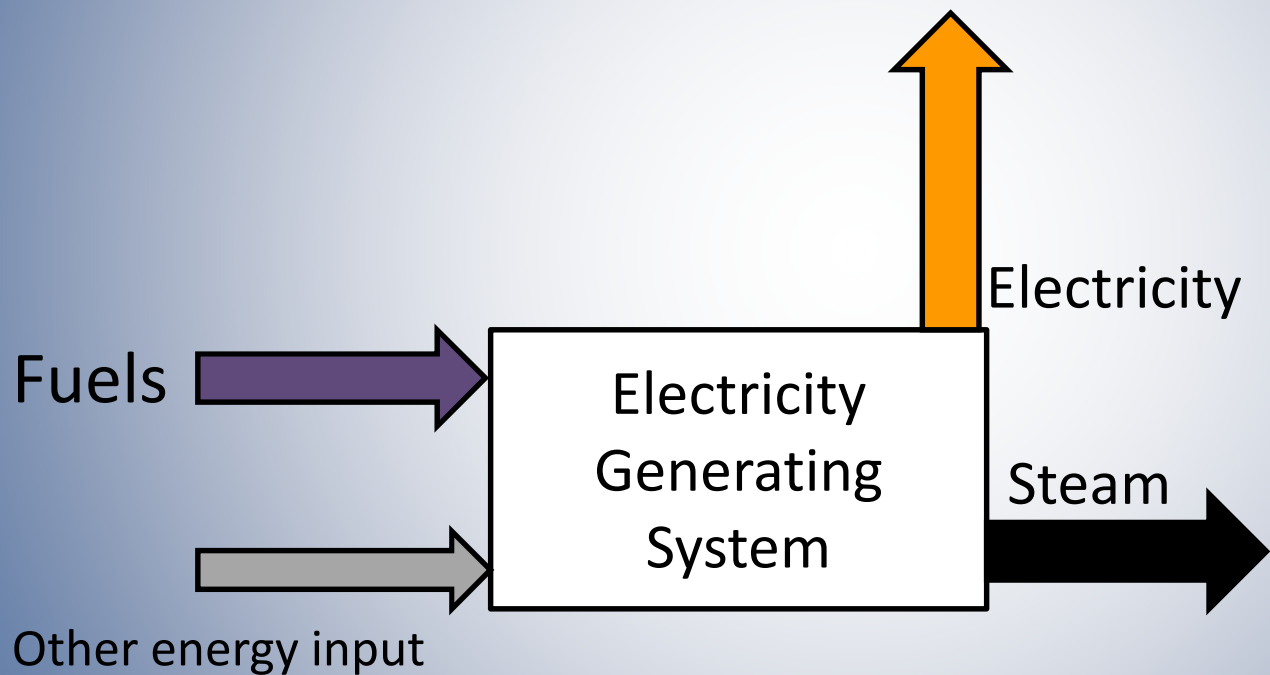
System Energy Accounting

- “System” boundary is the foundation for determining what energy quantities are to be reported under §95112(a) and (b)

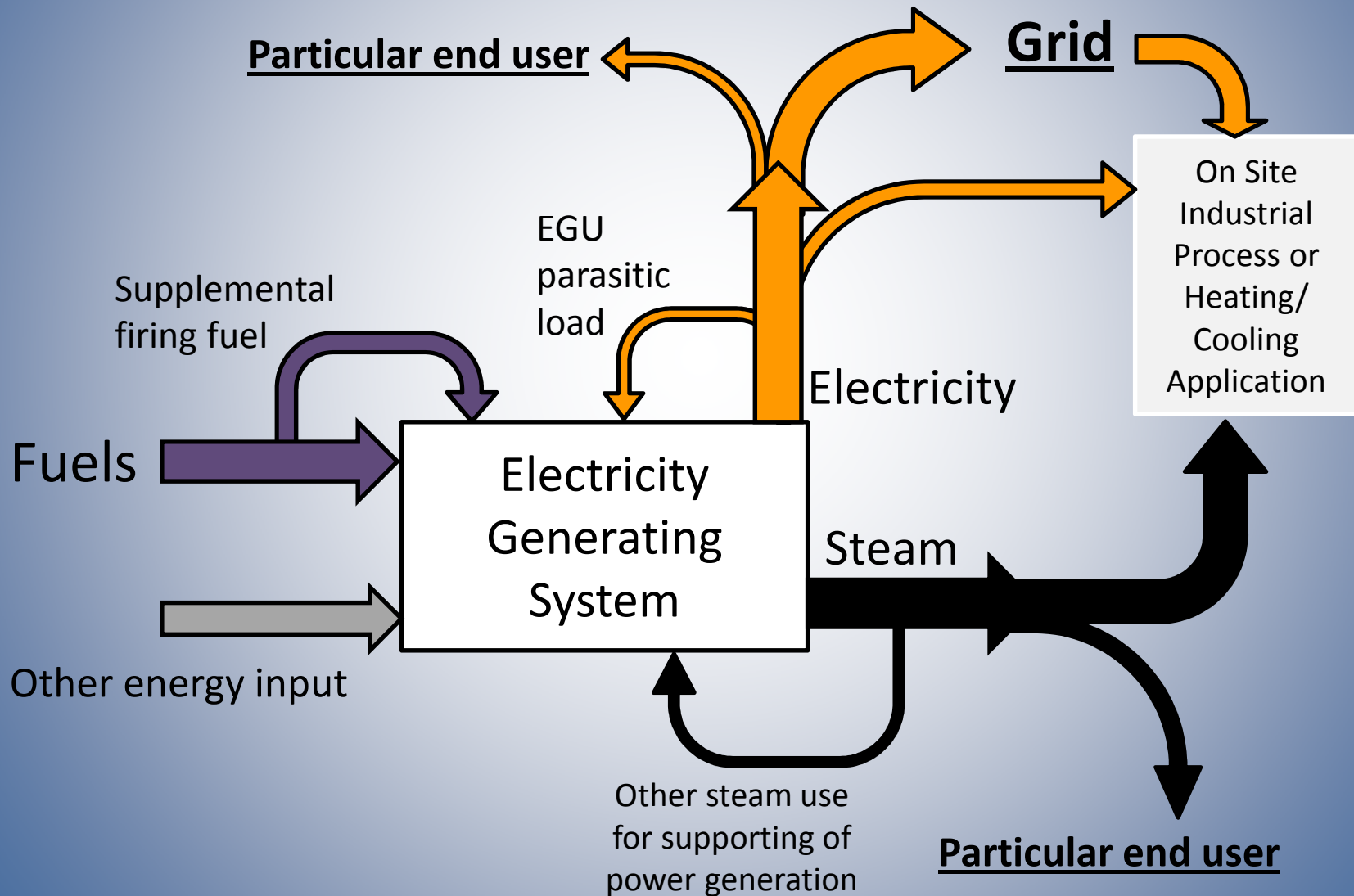


The difference between energy input and energy output is the energy that is wasted (e.g., heat released to the atmosphere, formation of air pollutants, vented steam, mechanical friction).

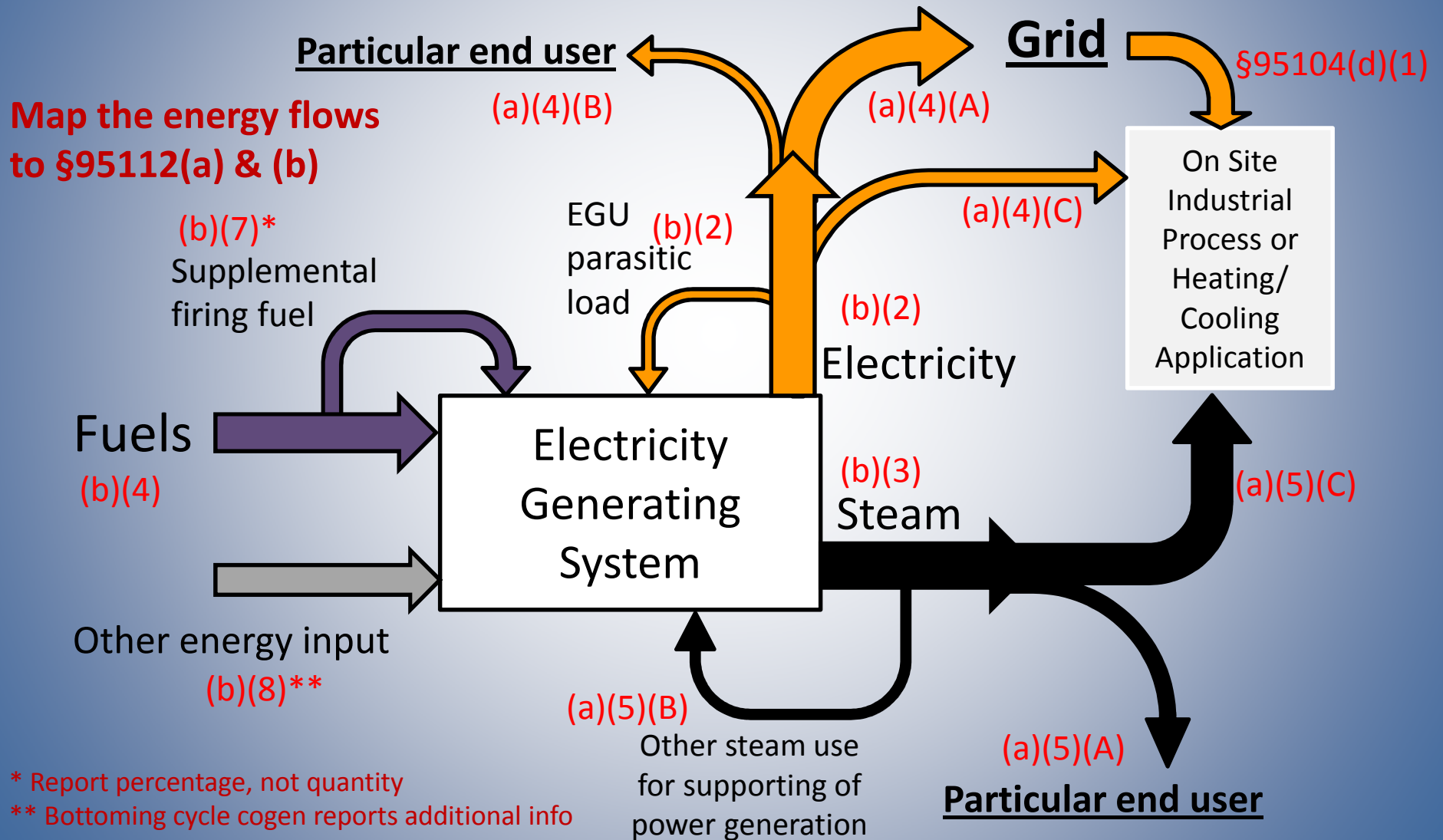
System Energy Accounting



System Energy Accounting



System Energy Accounting



System Energy Accounting

- §95112(b): accounts for the energy inputs and outputs of the EGU or the electricity generating system
- §95112(a): indicates where the generated energy flows go after they leave the system
- To ensure that system energy balance is completely accounted for, a system energy diagram is critical
- Skipping steps in system energy accounting may lead to erroneous reporting

System Energy Accounting

Follow these steps:

1. Draw a simplified block diagram. [§95112(a)(6) and §95102(a)]
2. Draw the system boundary of the electricity generating system.
3. Identify the energy flows that cross the electricity generating system boundary. (Look for “arrows” that cross the system boundary box.) Map the energy flows to the data items in §95112(b).
4. Identify the processes, operations, and destination to which generated energy is supplied. Map them to the data items in §95112(a).
5. Calculate the quantities required by §95112(a) and (b), and enter data into the reporting tool accordingly.

System Energy Accounting

Simplified Block Diagram:

[§95112(a)(6) and §95102(a)]

- Equipment associated with the electricity generating system, and any equipment or industrial processes outside of the system that may inform energy flows.
- Flows of energy (fuel input, electricity output, heat/steam output) shown with arrows and labels.
- Relative location of fuel meters and other fuel quantity measurement devices. (If necessary, use more than one diagram for legibility.)

Total Thermal Output

- Total amount of usable thermal energy that can potentially be made available for use in industrial/commercial processes, heating/cooling applications, or delivered to other end users. It includes:
 - Thermal energy provided or sold to a particular end-user [§95112(a)(5)(A)];
 - Thermal energy used for supporting power generation that has been included in the §95112(b)(3) quantity but is not accounted for in either §95112(a)(5)(A) or (C) [§95112(a)(5)(B)];
 - Thermal energy used in other on-site industrial processes or heating/cooling applications that are not electricity generation [§95112(a)(5)(C)];
 - Thermal energy that is vented, radiated, wasted, discharged, or otherwise not utilized

Total Thermal Output

The Sum of:
$$\begin{cases} \S 95112(a)(5)(A) \\ \S 95112(a)(5)(B) \\ \S 95112(a)(5)(C) \end{cases} \leq \S 95112(b)(3)$$

- The difference between the two sides of the comparison is the thermal energy that was generated by cogen/bigen units but was not utilized for any useful purpose (e.g., vented and radiated steam).
- Do not include thermal energy not generated by a cogen/bigen system in these quantities.
- Engineering estimation is acceptable, but the facility operator must demonstrate to the verifier that the chosen method is reasonable and based on good engineering principles.

Total Thermal Output

If there is more than one EGU or electricity generating system (EGS) at the facility and in the reporting tool configurations:

$$\text{The Sum of: } \left\{ \begin{array}{l} \text{\$95112(a)(5)(A)} \\ \text{\$95112(a)(5)(B)} \\ \text{\$95112(a)(5)(C)} \end{array} \right\} \leq \text{The Sum of: } \left\{ \begin{array}{l} \text{\$95112(b)(3) for EGU/EGS 1} \\ \text{\$95112(b)(3) for EGU/EGS 2} \\ \text{etc...} \end{array} \right\}$$

Steam generated by boilers that are not an integral part of the cogen/bigen system are not included in these quantities. Such steam is not reported unless it is sold to other entities outside of the facility boundary. (§95104(d)(4))

Gross and Net Generation

- Gross generation = total electrical output of the EGU
- Net generation = gross generation minus parasitic load

$$\text{The Sum of: } \left\{ \begin{array}{l} \S 95112(a)(4)(A) \\ \S 95112(a)(4)(B) \\ \S 95112(a)(4)(C) \end{array} \right. = \text{Net Generation } \S 95112(b)(2)$$

Gross and Net Generation

If there is more than one EGU or EGS at the facility and in the reporting tool configurations:

$$\text{The Sum of: } \left\{ \begin{array}{l} \text{\$95112(a)(4)(A)} \\ \text{\$95112(a)(4)(B)} \\ \text{\$95112(a)(4)(C)} \end{array} \right. = \text{The Sum of: } \left\{ \begin{array}{l} \text{Net gen for EGU/EGS 1} \\ \text{Net gen for EGU/EGS 2} \\ \text{Net gen for EGU/EGS 3} \\ \text{etc....} \end{array} \right.$$

Electricity used within the facility boundary that is not generated by the EGU/EGS should not be included in §95112(a)(4) quantities. Such electricity is accounted for in section §95104(d)(1).

Gross and Net Generation

- Electricity consumed at the facility when the EGUs were not generating electricity should not be counted against net generation, as doing so would make the EGU appear less efficient.
- Electricity acquired from outside of the facility boundary should be accounted under §95104(d)(1)
- EGU with low capacity factor: it is especially important to distinguish between parasitic load during EGU operation and internal electricity load during EGU downtime
- EGU with high capacity factor: reporter may exercise judgment if the gain in the system efficiency figure is insignificant

Returned Condensate and Makeup Water

- To avoid double counting of the energy in the steam-water loop, the enthalpy of the generated thermal energy must not include the enthalpy of the feedwater to boilers or HRSGs
- This can be done by simply using the temperature of the feedwater as the reference temperature for the enthalpy calculation of the generated thermal energy
- If the computerized data recording system is set up such that the reference temperature of the generated steam is different from the temperature of the feedwater, an adjustment calculation is needed

Reporting of Supplemental Firing

- If reporting as an aggregated-units configuration (such as in a “system”), the amount of supplemental firing fuel must be aggregated into the total fuel consumption number of the aggregated-units configuration (in the Fuel-Specific Emissions Information sub-module)
- New reporting tool feature added: new data fields for reporters to indicate what percentage of the total fuel consumption of the system is supplemental firing (in the Configuration Information sub-module in the unit configuration)

Unit/System Energy Balance

Energy Inputs > Energy Outputs

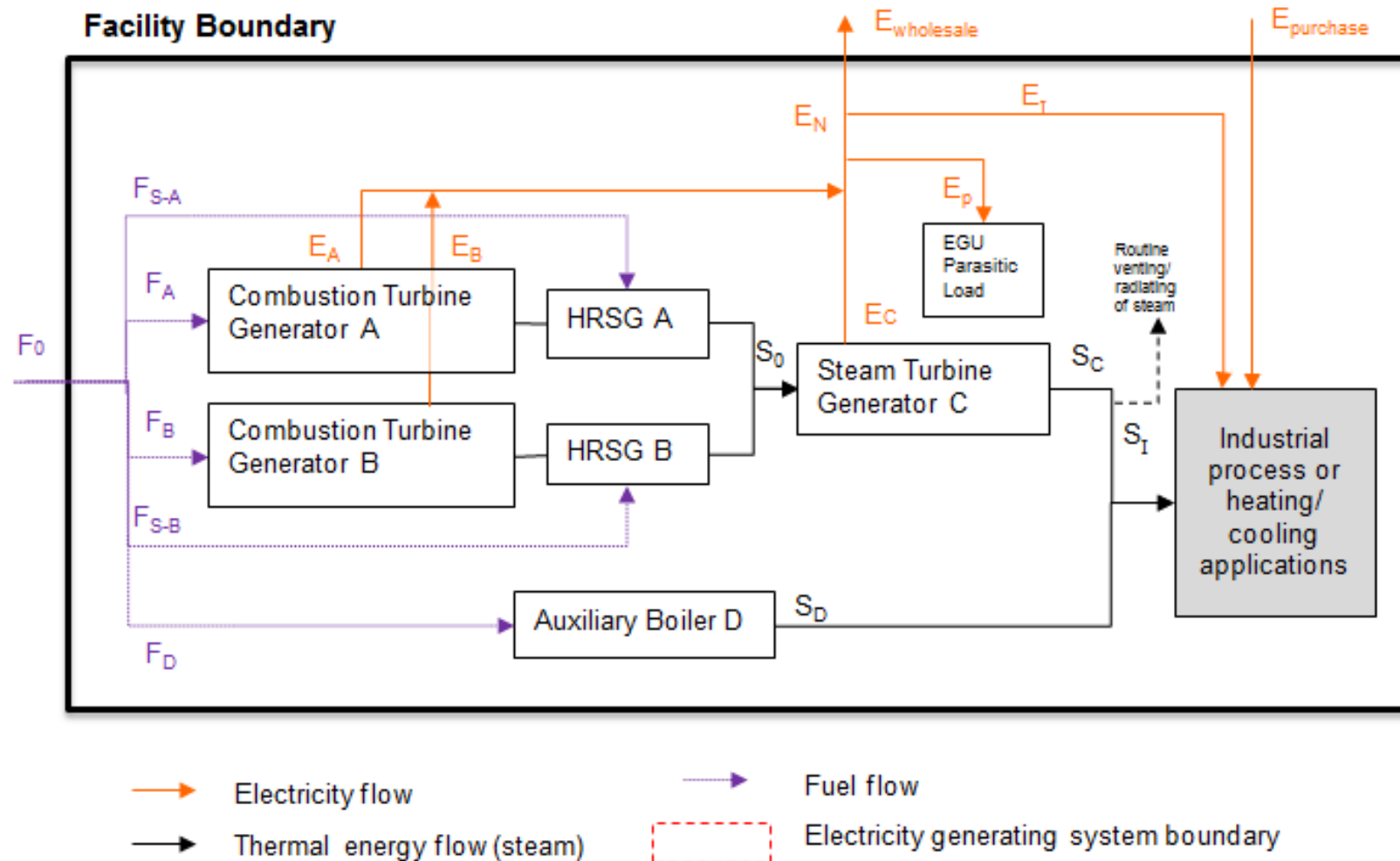
$$\text{The Sum of: } \left\{ \begin{array}{l} \S 95112(b)(4) \\ \S 95112(b)(8) \end{array} \right\} > \text{The Sum of: } \left\{ \begin{array}{l} \S 95112(b)(2) \\ \S 95112(b)(3) \end{array} \right\}$$

Questions?

- Next: examples of system energy accounting

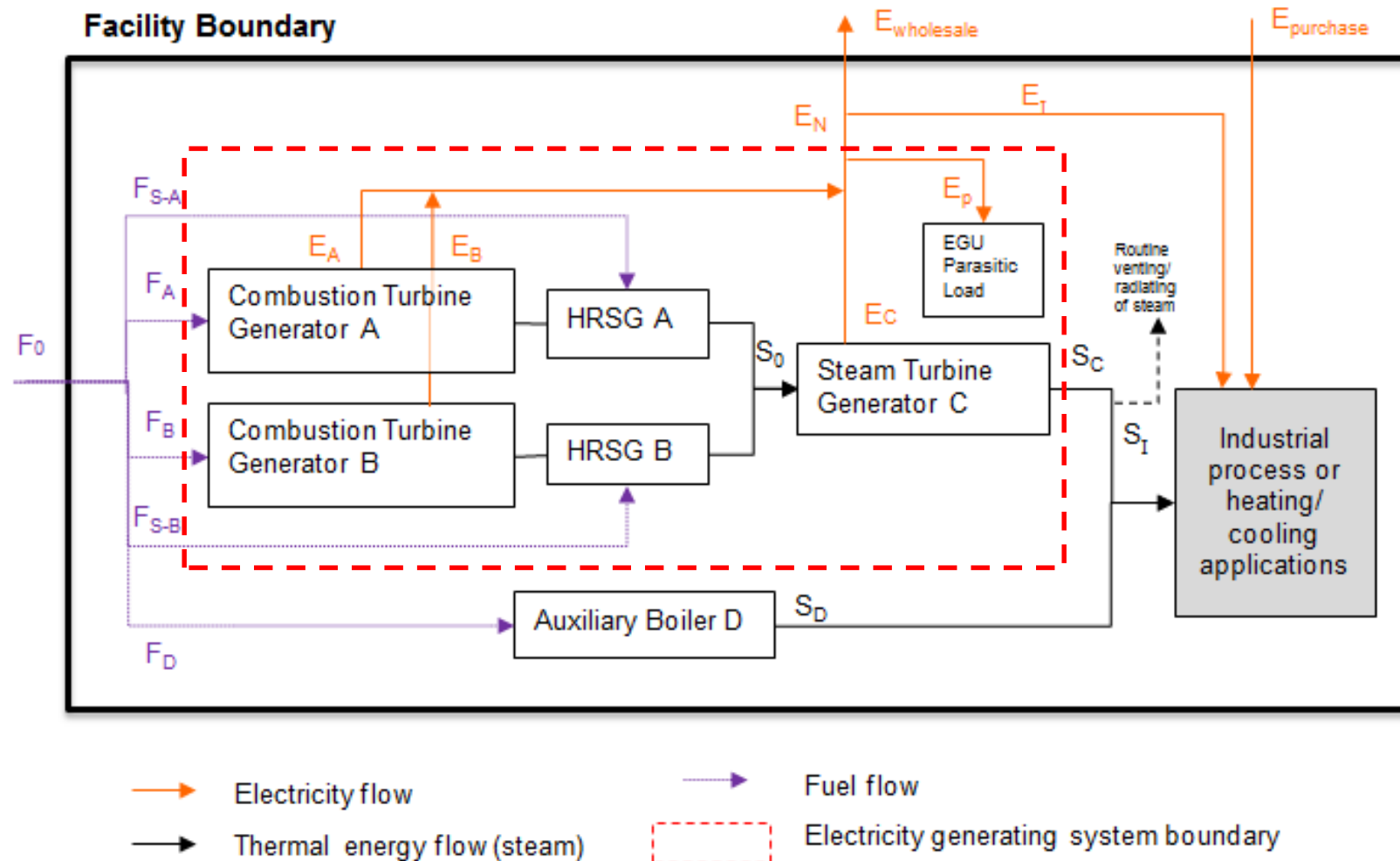
Example 1

Topping Cycle Cogen and an Aux. Boiler



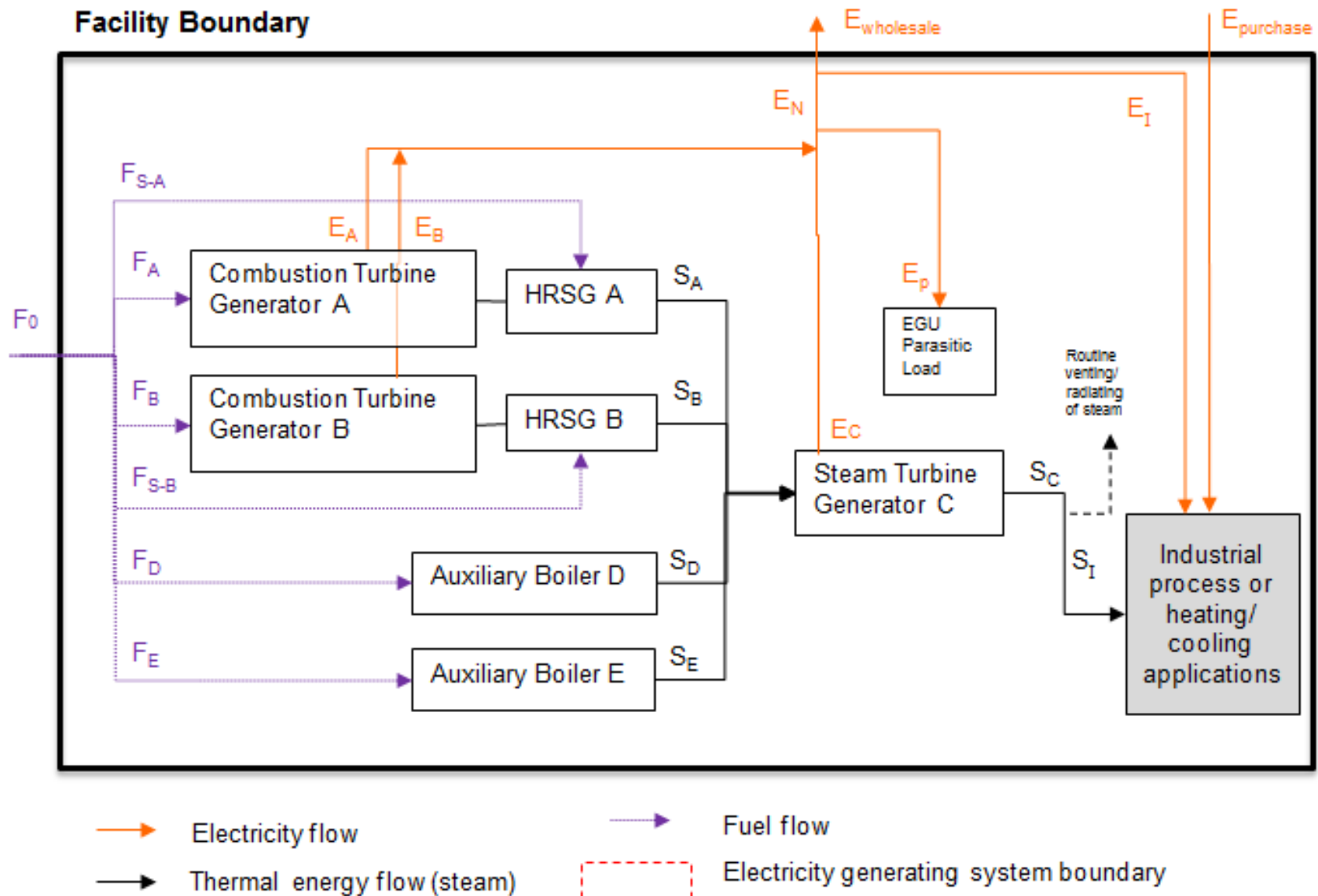
Example 1

Topping Cycle Cogen and an Aux. Boiler



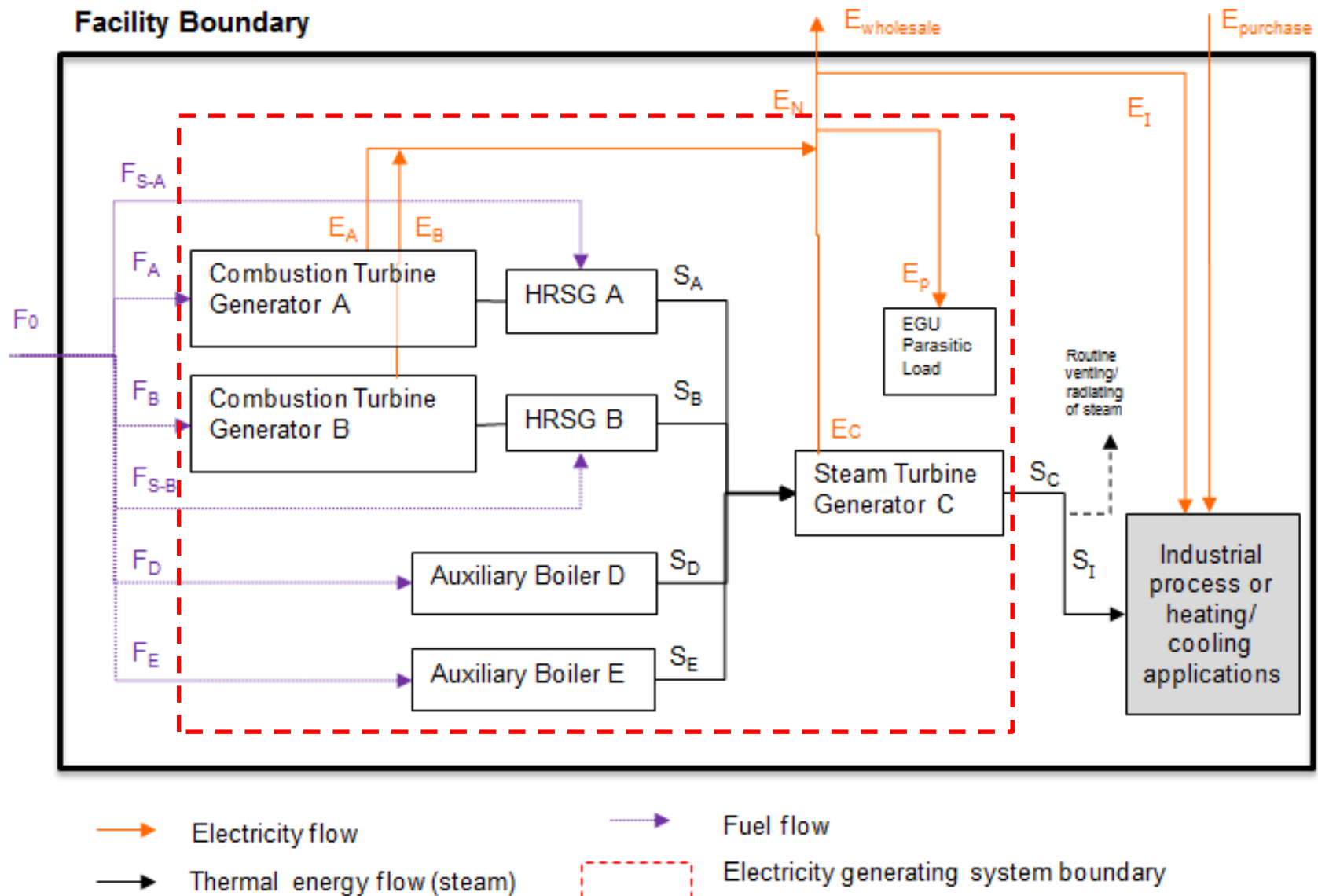
Example 2

Topping Cycle Cogen with Boilers



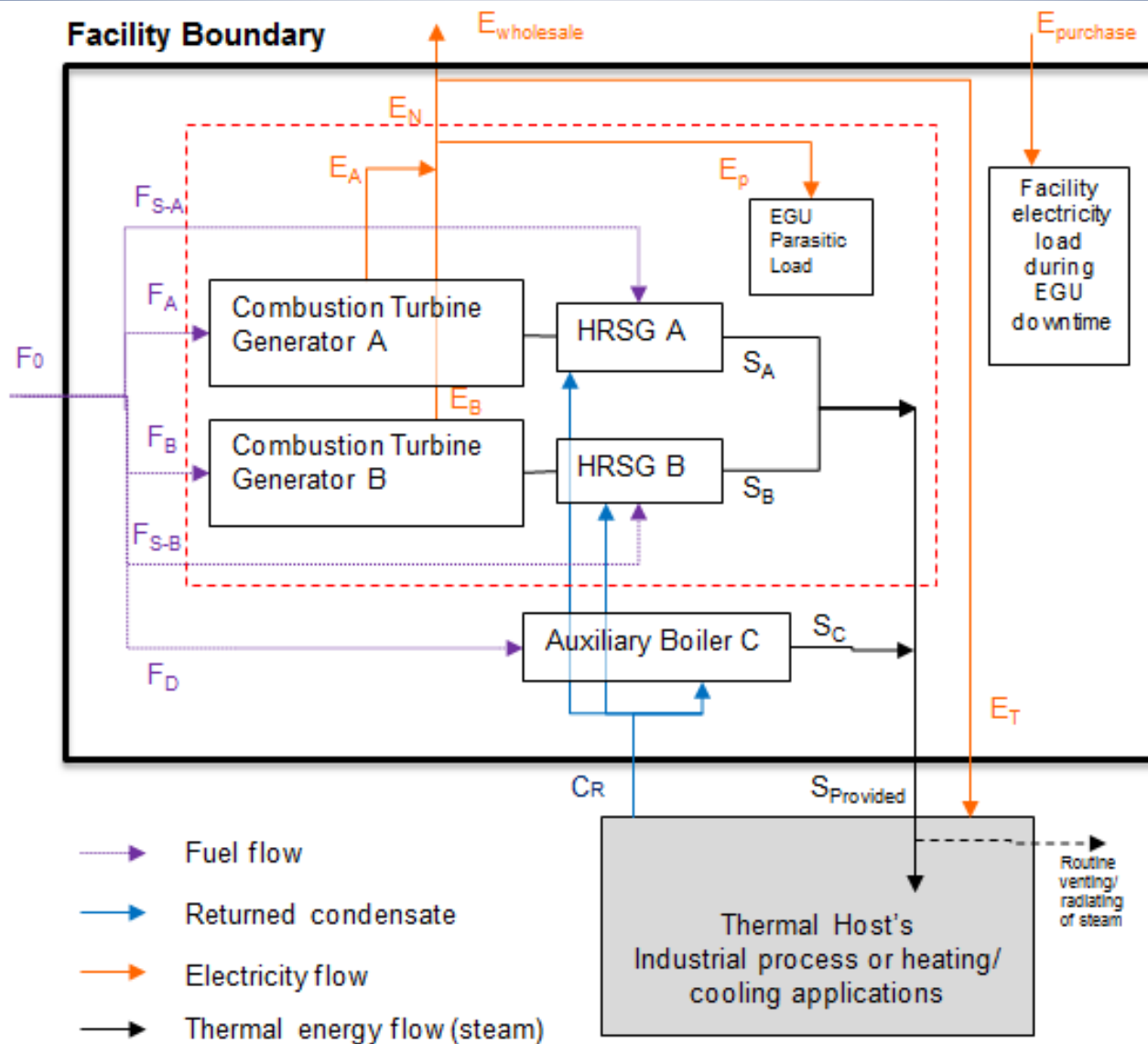
Example 2

Topping Cycle Cogen with Boilers



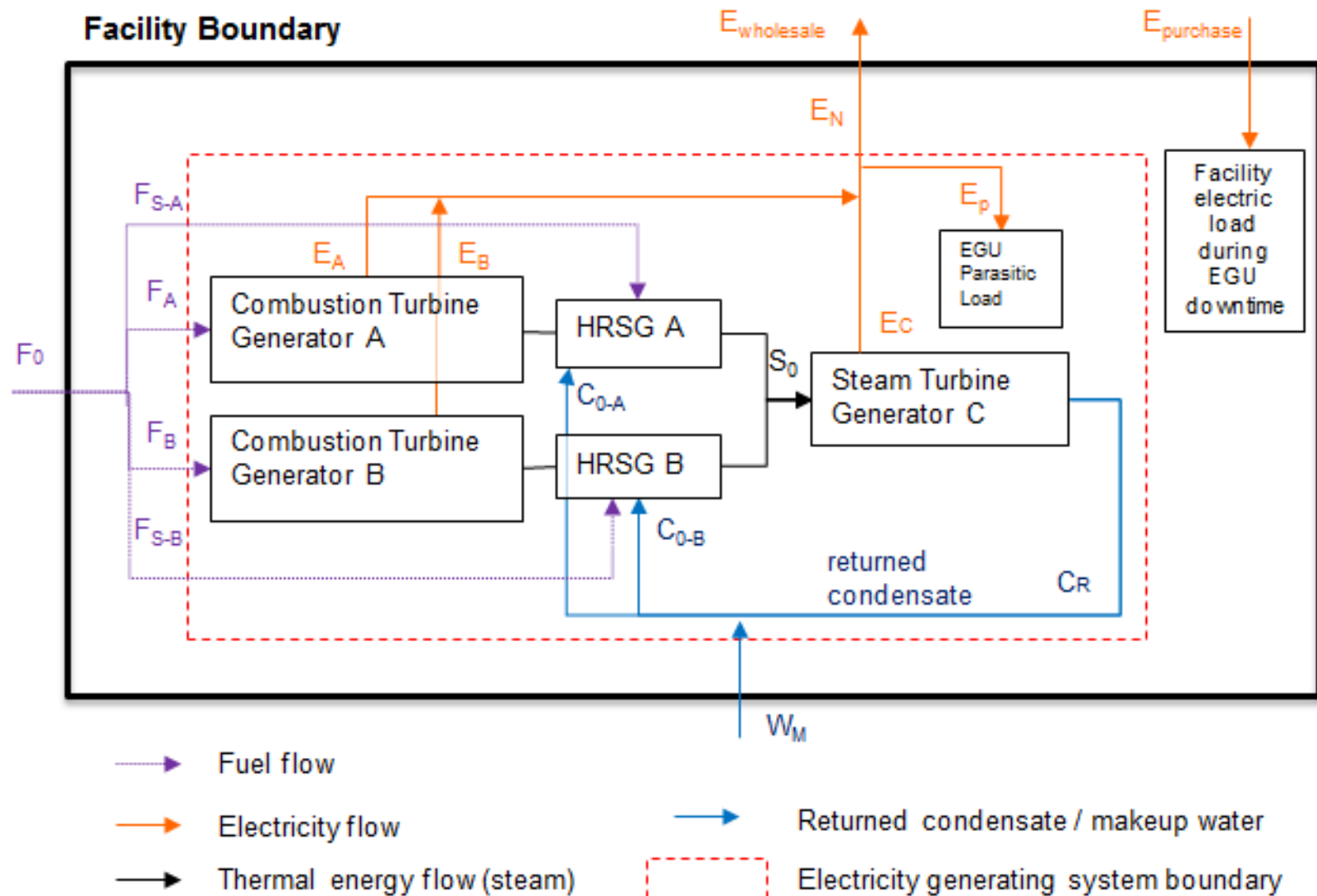
Example 3

A Cogen Facility and A Thermal Host



Example 4

Combined Cycle Power Plant



Guidance Document

- New guidance document available at:
<http://www.arb.ca.gov/cc/reporting/ghg-rep/guidance/guidance-docs.htm>
- Has additional examples of system energy accounting and mapping of the energy flows to §95112(a)&(b) requirements.
- There are countless combinations of generating system configurations. Reporters may need to refer to more than one example when doing system energy balance for their specific facility.
- Resubmit a new simplified block diagram if needed.

Resources

Helpful Web Sites

- Email reporting questions to: ghgreport@arb.ca.gov
- Reporting Guidance: Applicability, Metering
<http://www.arb.ca.gov/cc/reporting/ghg-rep/guidance/guidance.htm>
- Cal e-GGRT Tool Training: Registration, Subparts
<http://www.arb.ca.gov/cc/reporting/ghg-rep/tool/ghg-tool.htm>
- Cal e-GGRT Main Help Page
<http://www.ccdsupport.com/confluence/display/calhelp/Home>
- U.S. EPA Detailed Sector Training Slides
<http://www.epa.gov/climatechange/emissions/training.html>
(use as a supplement to ARB summary slides)

GHG Reporting Contacts

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Electricity Generation and Cogeneration Facilities	Anny Huang 916.323.8475
Electricity Retail Providers and Electricity Marketers	Wade McCartney 916.327.0822
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Product Data – Refineries, and Oil & Gas	Joelle Howe 916.322.6349
Greenhouse Gas Report Verification	Renee Lawver , Manager 916.322.7062
Chief – Greenhouse Gas Emission Inventory Branch	Richard Bode , Chief 916.323-8413

Questions?